

Name: _____

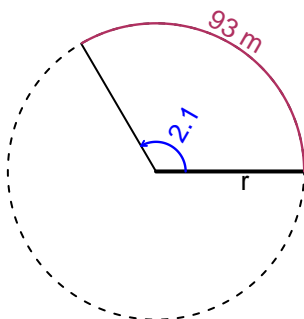
Date: _____

Trig Final (Solution v44)

- You should have a calculator (like [Desmos](#)) and a [unit-circle](#) reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 2.1 radians. The arc length is 93 meters. How long is the radius in meters?

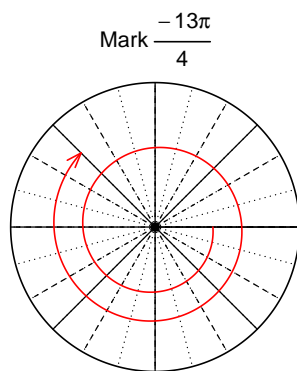


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$r = 44.29$ meters.

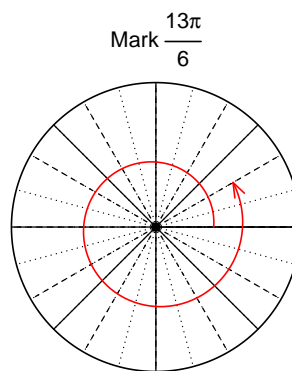
Question 2

Consider angles $-\frac{13\pi}{4}$ and $\frac{13\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(-\frac{13\pi}{4}\right)$ and $\cos\left(\frac{13\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\sin(-13\pi/4)$

$$\sin(-13\pi/4) = \frac{\sqrt{2}}{2}$$



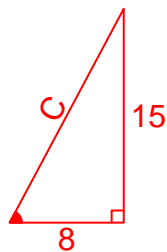
Find $\cos(13\pi/6)$

$$\cos(13\pi/6) = \frac{\sqrt{3}}{2}$$

Question 3

If $\tan(\theta) = \frac{-15}{8}$, and θ is in quadrant IV, determine an exact value for $\cos(\theta)$.

Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



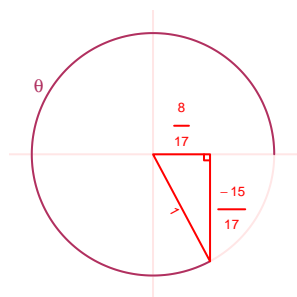
Solve the Pythagorean Equation

$$8^2 + 15^2 = C^2$$

$$C = \sqrt{8^2 + 15^2}$$

$$C = 17$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{8}{17}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 8.99 Hz, an amplitude of 6.08 meters, and a midline at $y = -4.35$ meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -6.08 \cos(2\pi 8.99t) - 4.35$$

or

$$y = -6.08 \cos(17.98\pi t) - 4.35$$

or

$$y = -6.08 \cos(56.49t) - 4.35$$